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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/755,844	01/12/2004	Carsten Ahrens	1890-0037	8442

7590 03/10/2006  
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Suite 3250  
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Indianapolis, IN 46204-5109

EXAMINER
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MALSAWMA, LALRINFAMKIM HMAR

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 03/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	Application No. 10/755,844	Applicant(s) AHRENS ET AL.	
	Examiner Lex Malsawma	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 February 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7,9-11 and 13-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7,9-11 and 13-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 16 February 2006 has been entered.

### ***Withdrawal of Indicated Allowable Subject Matter***

2. All pending claims have been carefully reconsidered, and the indicated allowability of claims 26, 16 and 18-25 is withdrawn in view of the newly applied reference(s) to Gupta et al. (US 2002/0163072 A1). Rejections based on the newly applied reference(s) follow.

### ***Claim Objections***

3. Claims 1, 9, 16, 19, 21, 26 and 27 are objected to because of the following informalities:

In claim 1, line 5, the examiner suggests changing “the first layer” to read, “the first conductive layer” and changing “send layer” to read, “seed layer”;

in claim 9, line 2, the examiner suggests changing “layers of same” to read “layers of the multiple-layer structure”, otherwise it would not be clear whether “same” refers to the “multiple-layer structure” or to the “seed layer”;

in claim 16, line 2, the examiner suggests changing “may consist” to read “consists”, otherwise, it is not clear whether or not the insulating layer should be a multiple stack of insulating layer, i.e., the word, “may”, would render the claim indefinite;

in claim 19, line 2, “multiple,-layer” should read “multiple-layer”;

in claim 21, line 2, “re- verse side” should read “reverse-side”;

in claim 26, line 8 (i.e., the second line from the bottom), the examiner suggests inserting “first” before “conductive layer”; and

in claim 27, line 5, the examiner suggests changing “may comprise” to read “comprises” for reasons similar to those stated above in reference to claim 16.

Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-7, 9-11 and 13-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta et al. (US 2002/0163072 A1; hereinafter, “**Gupta**”).

*Regarding claims 1, 13-23, 26 and 27:*

Gupta discloses a method for producing a contact structure on a structured surface of a substrate, the method comprising:

producing a first conductive layer comprising a multiple-layer structure (125/126/130) on the structured surface (Fig. 5), the first conductive layer comprising tungsten (note section 0028, wherein tungsten nitride, WN, is suitable for layer “130”, and the layer 130 serves as barrier layer), the multiple-layer structure including an insulating layer which comprises a multiple stack of insulating layers (125, 126), wherein the multiple stack of insulating layers is a barrier layer (section 0027, note the sentence bridging pages 2-3);

producing a conductive seed layer on the first conductive layer (note section 0029; furthermore, with respect to claim 1, a combination of layer “130”, WN, and the seed layer would be a multiple-layer seed-layer structure);

electroplating a contact structure 131 on the seed layer (section 0029);

selectively removing the contact structure, at least one of the layers (e.g., layer 130) of the multiple-layer structure of the seed layer acting as a stop layer in the selective removal (note process flow from Fig. 5 to Fig. 6, wherein the WN layer 130, positioned at the perimeter of the contact structure 131 remains after the removal step, i.e., the layer 130 acts as a stop layer because the removal step stops at a point where the layer 130 is exposed); and

selectively removing material from the reverse side of the substrate 202 by chemical-mechanical polishing, CMP, or by wet chemical etching (note Figs. 8-9; section 0031; and section 009, lines 10-13 and lines 31-35), at least one of the layers of the multiple-layer structure of the first conductive layer representing a stop layer in the selective removal (i.e., Fig. 9 shows that each of layers 125, 126, and 130 is exposed after the removal, therefore, any or all of the layers represent a stop layer). Therefore, Gupta anticipates these claims.

*Regarding claims 2-7, 9-11, 24 and 25:*

Gupta discloses at least a sublayer “130” of the first conductive layer is produced by means of CVD deposition (section 0028);

the substrate includes a semiconductor (silicon) substrate (section 0026, line 7);

the structured surface is a surface of an opening in the substrate (Figs. 3, 4 or 5);

the opening extends into the substrate in the vertical direction at a depth of greater than or equal to 20 pm (i.e., 4 to 9 microns,  $\mu\text{m}$ , note section 0026, line 9), where Gupta discloses (in section 0023) that reliable filling of vias occurs only when an aspect ratio is greater than 5 (i.e., an aspect ratio greater than 1:5), accordingly, Gupta at least anticipates an aspect ratio equal to 1:4;

the seed layer comprising a multiple-layer structure, wherein one layer “130” comprises a metallic barrier material, Ta, TaN, WN, etc. (section 0028); and

bumps are formed on the reverse side for electrically connecting the contact structure, (note Figs. 10-11 and section 0032, wherein an electrical connection to the contact structure 222 is formed with a “bump” above layer “220”; furthermore, note in section 0023, Gupta discloses thousands of vertical conductors are typically incorporated in an IC, accordingly, bumps would be formed on the reverse side for electrical connection), and with respect to claim 24, it is noted the electrical connection (i.e., the bump) is formed in the same manner used to form structure “131” (Fig. 6); therefore, a conductive connecting layer is deposited on the whole area of the reverse side of the substrate (note Figs. 10-11) after the reverse side of the contact structure 131 has been exposed, followed by a CMP process to acquire the “contact pad” shown in figure 11 (note in section 0032, lines 10-11, Gupta discloses “[t]he trench is...filled with a metal,

preferably copper, as described above”, i.e., the “filling” requires depositing a copper layer on the whole area of the reverse side prior to performing a CMP process to define the “contact pad/bump”). Therefore, Gupta anticipates these claims.

### ***Remarks***

6. Applicant's remarks/arguments have been carefully reviewed and considered but they are generally moot in view of the new ground(s) of rejection. In response to applicant's remarks with respect to the step for selectively removing the contact structure, it is noted that the claim language does not require the contact structure to be selectively removed with respect to any specific layer, i.e., even if portions of the seed layer are removed during the selective removal, the seed layer can still function as a stop layer, especially if the selective-removal process stops at a point where at least a portion of the seed layer is exposed (i.e., if the selective-removal process exposes any portion of a layer, then that “exposed layer” can be referred to as a stop layer). Put in another way, selectively removing the contact layer (as recited in the current claims) would include selectively removing “excess” material of the contact layer with respect to a “desired” portion of the contact layer, which must remain after the selective removal process, wherein any layer exposed by the selective-removal process can be referred to as a stop layer.

### ***Conclusion***


7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is 571-272-1903. The examiner can normally be reached on Mon. - Thur. (4-12 hours between 5:30AM and 10 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lex Malsawma 

March 3, 2006

  
MATTHEW SMITH  
SUPERVISORY PATENT EXAMINER  
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